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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/988,660	11/20/2001	Mark Myers	017750-507	9021

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EXAMINER	
LEE, SHUN K	

ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 03/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/988,660	MYERS ET AL.
	Examiner	Art Unit
	Shun Lee	2878

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 January 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4,6 and 9-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *4,6 and 9-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *0105*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 4, 9-13, and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howard *et al.* (US 4,507,551) in view of Applicant's Admitted Prior Art, Amos (US 5,369,511), and Ben-Menachem *et al.* (US 2001/0029816).

In regard to claims **4**, **9-13**, and **15-20**, Howard *et al.* disclose (Fig.) an infrared imaging apparatus, comprising:

(a) a dewar (10), having an internal volume that defines a cold space;

(b) an IR transmissive window (28) that seals the cold space to receive IR energy directly from an IR source;

(c) a first lens (12) located within the cold space to receive IR energy directly from the IR transmissive window (28), wherein the first lens (12) is made of germanium (column 2, lines 63-68);

(d) an IR detector (14) located within the cold space in operational communication with the first lens (12); and

(e) an optical stop (16) located within the cold space in front of the first lens (12).

While Howard *et al.* also disclose (column 2, line 9 to column 3, line 30) using well known techniques of lens system design in order to obtain a desired field of view, the apparatus of Howard *et al.* lacks an explicit description that the first lens (12) is an aspheric silicon lens with a first aspheric profile (*e.g.*, radius=-0.94467, k=28.345216; a=-2.13952, b=-69.5274, c=2342.04, d=-56841.9, and first surface thickness=0.548467 or radius=-1.23508; k=36.049455; a=-1.69104; b=-98.6413; c=5589.83; d=-162359; and first surface thickness=0.761661) on a first side and on a second side facing the detector and parallel to the first side, a second aspheric profile (*e.g.*, radius=-0.61281; k=0.1399; a=0.033459; b=-2.3598; c=10.889; d=-36.331; and second surface thickness=0.462731 or radius=-0.81270; k=-0.10748; a=0.054475; b=-0.72423; c=2.9155; d=-7.8939; and second surface thickness=0.480234) having a holographic optical element (*e.g.*, -0.0051393, -0.10212, 0.91035, -2.3946 or -0.017112, -0.038991, 0.55069, -1.6405) for color correcting a first color band of infrared energy having wavelengths of 3 to 5 micrometer and coincidently focus at the common focal plane the first color band a second color band of infrared energy having wavelengths of 8 to 12 micrometer such that at least a first IR energy wavelength and second IR energy

wavelength (which is a harmonic component of the first wavelength) is at a position coincident (*i.e.*, common focal plane) to the IR detector (14) so as to provide a square field of view of 90X90 degrees with an F-stop (F/#) of at least 1.4.

However, techniques of lens system design comprising aspheric surfaces are well known in the art. For example, Applicant admits (paragraph 0027) it is well known in the art to use commercially available software for designing aspheric lens. Further, Ben-Menachem *et al.* teach (paragraphs 0002, 0003, and 0075) that a single element (*e.g.*, an aspheric silicon lens for the infrared wavelength regions) with a holographic optical element on an aspheric surface provides optimum design benefit wherein residual aberrations are corrected. In addition, Amos teaches (column 18, line 43 to column 19, line 9) that a holographic optical element corrects chromatic aberration so that all wavelengths of the infrared light combine at a point or focus. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide an aspheric silicon lens with a holographic optical element in the apparatus of Howard *et al.*, in order to correct for optical (*e.g.*, chromatic) aberrations so as to obtain a desired field of view (*e.g.*, a square field of view of 90X90 degrees with an F-stop (F/#) of at least 1.4).

4. Claims 6 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howard *et al.* (US 4,507,551) in view of Applicant's Admitted Prior Art, Amos (US 5,369,511), and Ben-Menachem *et al.* (US 2001/0029816) as applied to claim 4 above, and further in view of Tennant *et al.* (US 6,034,407).

In regard to claims **6** and **14**, which are dependent on claim 4, the apparatus of Howard *et al.* lacks that the detector is a hyperspectral detector which detects at least three wavelengths of IR energy including at least one LWIR band of energy and concurrently collects radiation from multiple, adjacent spectral radiation bands. However, hyperspectral detectors are well known in the art. For example, Tennant *et al.* teach (column 1, lines 17-36, column 2, lines 13-36) that a hyperspectral detector offers concurrent collection of multiple, adjacent spectral infrared radiation bands. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide a hyperspectral detector in the apparatus of Howard *et al.*, in order to detect multiple, adjacent spectral radiation bands (*e.g.*, at least three wavelengths of IR energy including at least one LWIR band of energy).

Response to Arguments

5. Applicant's arguments filed 19 January 2005 have been fully considered but they are not persuasive.

Applicant argues (first paragraph on pg. 8 to last paragraph on pg. 10 of remarks filed 19 January 2005) that the HOE of Amos cannot function to correct a first color band of infrared energy having wavelengths of 3 to 5 micrometer and coincidently focus at a common focal plane the first color band and a second color band of infrared energy having wavelengths of 8 to 12 micrometer as presently claimed since the "useful" bandwidth mentioned in section 4.5.2 Diffraction Efficiency and 4.5.5 "Useful" Spectral Bandwidth is less than that obtained from the claimed infrared imaging apparatus. Examiner respectfully disagrees. Amos states (column 18, lines 47-60) that " ... one

may employ ... diffractive components such as holographic optical elements ... binary optics techniques add a notched diffractive component to the refractive lens so that chromatic aberration is corrected. This results in all wavelengths of the light being combined at a point or focus" and (column 5, lines 11-15) that "It is again emphasized that the principles of the instant invention are applicable to the entire electromagnetic spectrum and are not limited to conventional holography or to the visual or near-visual spectra, such as ultraviolet and infrared frequencies or X-rays". Further, the key phrase in the section 4.5.4 (pg. 100) is "Based on the scalar theory,[3] the diffraction efficiency for the first diffraction order is ... ". Thus this section only discuss the first order diffraction efficiency as a function of wavelength and does not discuss the diffraction efficiency as a function of wavelength at other diffraction orders. It should be noted that first order diffraction efficiency only indicates efficiency as a function of wavelength for the first diffraction order and does not indicate that chromatic aberration is not corrected. On the contrary in section 4.5.2 (pg. 96), it is expressly stated that by assigning the proper power to each element, their individual chromatic contributions cancel (*i.e.*, chromatic aberration is corrected, see Fig. 4.26). Thus the HOE of Amos corrects a first color band of infrared energy having wavelengths of 3 to 5 micrometer and coincidently focus at a common focal plane the first color band and a second color band of infrared energy having wavelengths of 8 to 12 micrometer. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide an aspheric silicon lens with a holographic optical element in the apparatus of Howard *et al.*, in order to correct for optical (*e.g.*, chromatic) aberrations so as to obtain

a desired field of view (*e.g.*, a square field of view of 90X90 degrees with an F-stop (F/#) of at least 1.4).

Applicant then argues (pg. 11 of remarks filed 19 January 2005) that the elements in Ben-Menachem *et al.* cannot corrects a first color band of infrared energy having wavelengths of 3 to 5 micrometer and coincidently focuses at the common focal plane the first color band and a second color band of infrared energy having wavelengths of 8 to 12 micrometer as presently claimed since the elements in Ben-Menachem *et al.* operate on only one of the two claimed wavelength ranges. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In this case, Ben-Menachem *et al.* state (paragraph 0075) that " ... Diffractive optical element patterns are produced by machining, on the surface of the element, a diffractive structure ... used to further correct for residual aberrations present in the element. In this way, the optimum design benefit can be obtained from a single element. Diffractive optics patterns can be applied to any surface, whether flat, spherical or aspheric". Thus Ben-Menachem *et al.* explicitly teach that a single element (*i.e.*, aspheric silicon lens) with a holographic optical element on an aspheric surface provides optimum design benefit wherein residual aberrations are corrected. As discussed above, Amos expressly teaches that a holographic optical element corrects chromatic aberration so that all wavelengths of the infrared light combine at a point or focus. Therefore the

obvious combination of the cited references disclose, teach or suggest all recited claim limitations including a holographic optical element on an aspheric surface which color corrects at least two color bands of infrared energy.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shun Lee whose telephone number is (571) 272-2439. The examiner can normally be reached on Tuesday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SL

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